E-waste Not, E-want Not

What is *E-waste*? Discarded electronics–generally referred to as 'e-waste'–can include any of our electronic waste items such as CDs, DVDs and DVD players, computers, television sets, video games and cell phones. In 2003, the United States had over 3.2 million tons of electronic waste! The e-waste pile is growing around the world and statistics show that it runs into millions of tons annually. More and more countries are drafting legislation for the environmentally-friendly disposal of this waste. Disposal techniques vary widely from country to country because it includes materials which are valuable and recyclable, as well as toxic. While modern technologies allow for nearly hazard-free recycling of e-waste, precautions must be taken to control harmful emissions and toxins that cause detrimental impacts on health and the environment. Electronic circuit boards, batteries, and Cathode Ray Tubes (CRTs) can contain *hazardous materials* such as lead, mercury and chromium. If improperly handled or disposed, these toxins can be released into the environment through landfill *leachate* or *incinerator ash*. Businesses and large generators of electronic waste are already required to comply with federal and state laws concerning the proper disposal of electronics, but there are currently not any laws to govern the disposal of residential electronics in Wisconsin.

Learning Objectives: To help students comprehend issues surrounding electronic waste in our society and how its disposal affects our quality of life as well as the environment.

Subjects: Science, Social Studies, Environmental Education, Family and Consumer Education

Wisconsin Model Academic Standards: C H.8.2, SC C.8.2, SS D.8.11, SS A.8.11, EE A.8.2, EE A.4.4, EE A.8.2., FCE intermediate A.2, A.3.

Grades: 6-8

GOING BEYOND

1. Does your community have a computer recycling program? If not, draft a letter to your local solid waste manager asking if they are developing a computer recycling program and express your support for such a program.

2. Investigate other states in the US and other countries that have electronics and/or computer landfill policies. Write a paper comparing the similarities and differences of these policies.

3. Find out when your school's computers or other electronic items (e.g., TVs, fax machines, copiers) are up for replacement and find resources to help them be recycled and/or disposed of in an environmentally friendly manner.

4. Compare past and present technologies related to electronics and describe the effects of technological change, either beneficial or harmful, on people and the environment.

5. Have each student write a one page "reflection" on their thoughts regarding e-waste and the activity they completed.

Materials: "Know Your Role" handout, electronics background information, large sheet of paper, markers

Procedure: Provide a copy of the electronics recycling background information to each student. Divide students into groups of four to eight individuals and hand out the "Know Your Role" handout. Give each group a large sheet of paper and markers. Have the students read the background information and their roles. Explain to the students that they are the person identified on their role description and that they have been invited to participate in a group discussion on drafting a computer disposal policy for the state of Wisconsin. Give the groups 30-45 minutes to discuss their stances on the issue and to record on the large sheet of paper ideas for a computer disposal recycling policy that meets most of their groups' concerns.

Policies Can Address: What types of electronic waste will be included in the policy? Who will the policy affect? Who will be responsible for the costs of recycling the items (i.e., consumer, manufacturer, store that sells items) and why? How will you gain support of your policy from the public, manufacturers, and electronics stores?

Afterward, each group can present their ideas to the class. Follow-up questions after the presentation of policy ideas can include:

- What went well doing your group discussions?
- What was a challenge?
- How are some of the groups' policies the same?
- How do they differ?

WHAT IS E-WASTE?

E-waste is electronic waste (electronic equipment) that is thrown away. It includes many types of electronics from computers and their monitors, to cell phones and stereos. Unfortunately, electronic waste is among the fastest growing waste types in the United States.

WHY IS E-WASTE A PROBLEM?

As technology quickly develops, people are constantly getting new equipment and stop using their old equipment. An electronic product may contain more than 1,000 different substances, some of which can be harmful to human and environmental health. If old equipment is not properly recycled, these substances could get into the air, soil and water.

WHAT ARE MY OPTIONS?

The best option for all electronic equipment is reuse, either by selling or donating it. Using equipment again extends the life of the product and makes it available to others who can still use it. However, sometimes reuse is not an option. If equipment is beyond its useful life, people can do their part and recycle it responsibly. Together, we can make a difference in the fight against e-waste!

WHAT HAZARDOUS MATERIALS ARE IN ELECTRONIC PRODUCTS?

Electronic products such as printed circuits, Cathode Ray Tubes (CRTs) and Liquid Crystal Displays (LCDs) screens often contain a lot of heavy metals and other substances. These substances are known to cause harm to humans and the environment when thrown away and not reused or recycled. Cadmium, lead, mercury, and arsenic are some of these substances.

WHAT RECYCLABLE MATERIALS ARE IN ELECTRONICS PRODUCTS?

Consumer electronics contain a variety of recyclable materials like metals, glass, and plastics. All of these materials can be reused to create new products, which decreases the need to mine the earth for raw resources.

## ARE CONSUMER ELECTRONICS MANUFACTURERS DOING ANYTHING TO MAKE A CHANGE?

Manufacturers are taking action to help with e-waste in a number of ways, from changing product designs to offering reuse and recycling programs. Many manufacturers are working to "design out" hazardous materials and "design in" environmentally-sound materials, including recycled content. They are also always changing product designs in order to make electronics products easier to recycle. Finally, many manufacturers offer recycling services free of charge or for a small fee.

WHERE DOES E-WASTE GO NOW?

Up to 75 percent of unused computers are stored in the closets, basements and offices of the original owners. Fifty percent of computers being recycled are still in good working order and could be reused. It has been reported that 85 percent of computers that are "thrown in the garbage" end up in a landfill. According to a US Environmental Protection Agency (EPA) report from 2002, up to 70 percent of heavy metal (lead, mercury, cadmium, etc.) contamination in US landfills comes from electronic products that are disposed of incorrectly.

IN FACT

From 1975 to 2004, the sales of personal computers (PCs) were estimated at 1.4 billion. In the five year span from 2005 to 2010, it is estimated that PC sales will reach 1.3 billion units, or nearly as many as the first three decades since the PC was introduced to the market.

Source: Consumer Electronics Association and Computer Industry Almanac, 2006
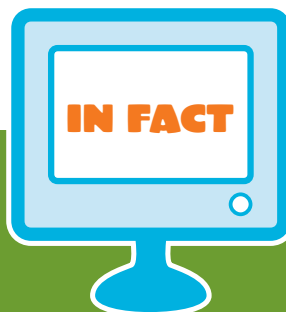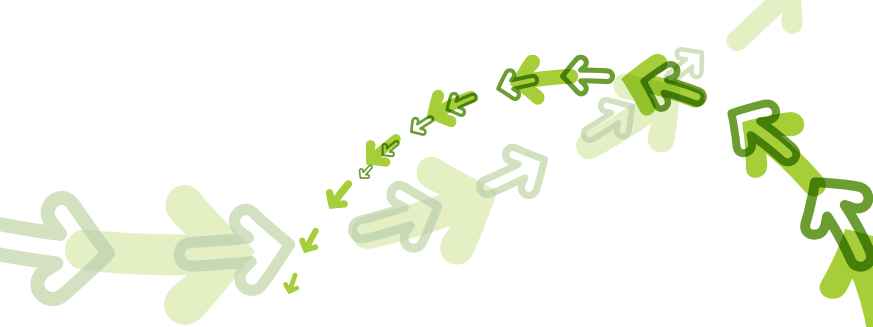
HOW MUCH E-WASTE IS PRODUCED EACH YEAR?

The EPA predicts that nearly 250 million computers will become useless between the years 2005 and 2010. In California alone, 6,000 computers become useless each day. Less than ten percent of computers are currently being recycled. The rest are put in storage, thrown away in landfills, incinerators or sent to other countries as hazardous waste.

WHAT ELECTRONIC EQUIPMENT IS RECYCLABLE?

Many components of electronic equipment—including metals, plastic, and glass—can be reused or recycled, while others may present environmental hazards if not managed correctly.

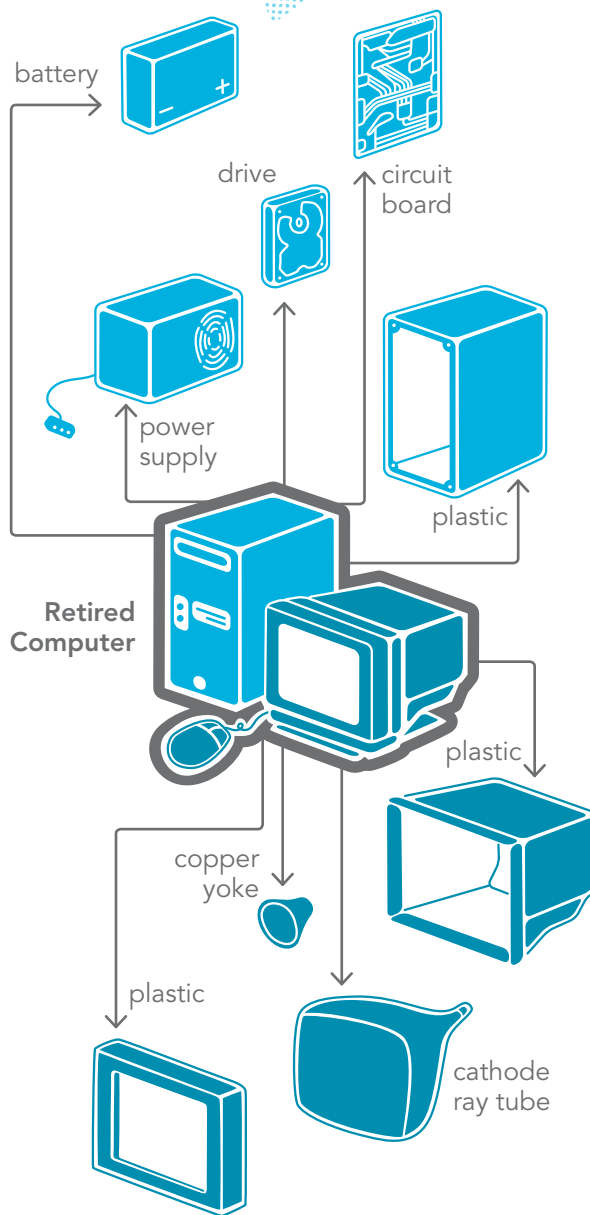*Source: Rethink Initiative, 2006*

WHAT CAN I DO ABOUT IT?

Reduce: Maintain and keep equipment as long as possible. A typical computer's life span is 2-3 years, but can be extended by 1-2 years with some upgrading. Buy a good monitor; it can last 6-7 years or more, and keep it for use with your next computer. Consider leasing a computer so you can trade it in for a new one at the expiration of the lease. Be sure to always use a surge protector power strip with all electronic equipment.

Reuse: A more recent computer can often be fixed, upgraded and reused instead of being replaced.

Recycle: Electronic equipment can be recycled for the recovery of metals, plastics, glass and other materials. You can ship your equipment directly to a recycler, or you may also be able to take advantage of manufacturer trade-ins to get credit towards buying new products. Also, old, rechargeable batteries can be recycled through many stores that sell new ones.

WHAT'S INSIDE?

A BRIEF LOOK AT THE MATERIALS THAT CAN BE RECOVERED FROM YOUR COMPUTER.

battery · drive · circuit board · power supply · plastic · **Retired Computer** · copper yoke · plastic · plastic · cathode ray tube

MARKETABLE MATERIALS THAT CAN BE RECOVERED FROM E-WASTE:

Crushed glass	Power supplies
Circuit boards	Copper yokes
Scrap metal	Fluorescent tubes
Wire	Batteries
Hard drives and other	Ink jet and laser cartridges
types of drives	Plastic

CONCERNED CITIZEN

Your name is Sara Stevens and you are a citizen of Vernon County, Wisconsin. About 5 years ago you purchased what you thought was a top of the line computer system. Now in only five years, it is four times slower than any of the current computers on the market and doesn't have the capacity to meet your needs. You have a new computer in mind, but are concerned with the lack of options for recycling your old computer. You have contacted the local county waste manager and state officials about recycling options, but haven't had any luck with an answer for where to take your computer. You have read that the disposal of computers in landfills can cause harm to people and the environment. You have agreed to sit in on a focus group to talk about forming a statewide policy on computer recycling. You feel very strongly that computer manufacturers are liable for recycling computers.

HEAD OF COMPUTER MANUFACTURING COMPANY

Your name is Bob Biggins and you are the owner of a worldwide computer manufacturing company. Your company, Orange Computers, makes millions of computers annually and distributes them all over the world. You feel very strongly that computer recycling should be dealt with by the consumer and not by the manufacturer. You have heard of other countries attempting to pass policies with manufacturers paying for the cost of computer recycling, and it makes you very nervous. If a policy like this was passed in Wisconsin, you are afraid that more states would adopt similar policies and this could cost your company millions of dollars in profits. You have been invited to sit in on a focus group to talk about forming a statewide policy on computer recycling, but aren't very happy to be attending.

COUNTY SOLID WASTE MANAGER

Your name is Chuck Composten and you are the solid waste manager for Pierce County, Wisconsin. Your job involves supervising all of the county's waste disposal needs and complying with Wisconsin's waste and recycling laws. You have had many contacts from citizens recently wanting options to dispose of their used computers and electronics in an environmentally sound manner. Recycling is the law in Wisconsin, but the law only requires aluminum, plastic, glass, and paper to be recycled. Residential computer recycling is optional in the state and county, so there is little funding available for a recycling program. You support of the ideas for a statewide policy as long as the funding doesn't result in an increase in state and local taxes. If computer recycling became a state-wide policy, environmental grants might become available to cover some but not all of the costs.

OWNER OF ELECTRONICS STORE

Your name is Melinda Deevdee and you are the owner of a statewide chain of electronics stores in Wisconsin. Your stores are called Electronics-N-More, and you have the best selection of computers in the state. Overall, your stores sell the most computers in the state and you'd like to keep it that way. You have initiated a voluntary computer trade-in incentive program for people to bring in their old computers and get money off the purchase of a new one. The old computers you receive are sent to developing third world countries that disassemble the computers, create new systems and recycle what they can't use. You'd like to see more options available like this in the state, but are reluctant to have to carry the burden of the cost anymore. If you could pass on the cost of recycling the old computers to the purchaser or manufacturer that would be ideal.

STATE LAWMAKER

Your name is Margaret Capitol and you are a state assembly woman for Wisconsin. Your job involves proposing and voting on new policies and laws for the state. You have gotten one or two contacts about recycling issues in the state, but none specific to computer recycling. You don't know much about the issue, but have pledged to try to balance the needs of all of the interest groups involved with the issue of computer recycling.

LANDFILL OWNER

Your name is Pat Landphil and you've owned a sanitary landfill in Sheboygan County since it was built in 2004. You know that electronics items and residential computers are routinely disposed of at your facility. Your primary concern is your company's bottom line. You are making a good profit on the computers disposed of at your landfill. You are opposed to policies that would take away business and profits from your landfill.

STATE WASTE MANAGEMENT SPECIALIST

Your name is Les Wasten and you work for the Wisconsin Department of Natural Resources as a Recycling Specialist. You helped to draft the state's recycling laws that went in to effect in 1995 (for aluminum, plastics, paper, etc). You also work with local communities to enforce the state's recycling laws and coordinate recycling grants. You are 100 percent in support of a statewide ban on computers in landfills and hope that a policy will be developed to mandate recycling computers.

ENVIRONMENTAL ACTIVIST

Your name is Betty Proteckalot and you are the president of the Wisconsin chapter of Recycle Now! Recycle Now! is a non-profit, nationwide group of people interested in promoting environmentally sustainable waste disposal, and the three R's of reduce, reuse and recycle. You want a statewide ban on the disposal of computers in Wisconsin's landfills. You have a difficult time understanding why others wouldn't want to find an environmentally friendly way to recycle computers.
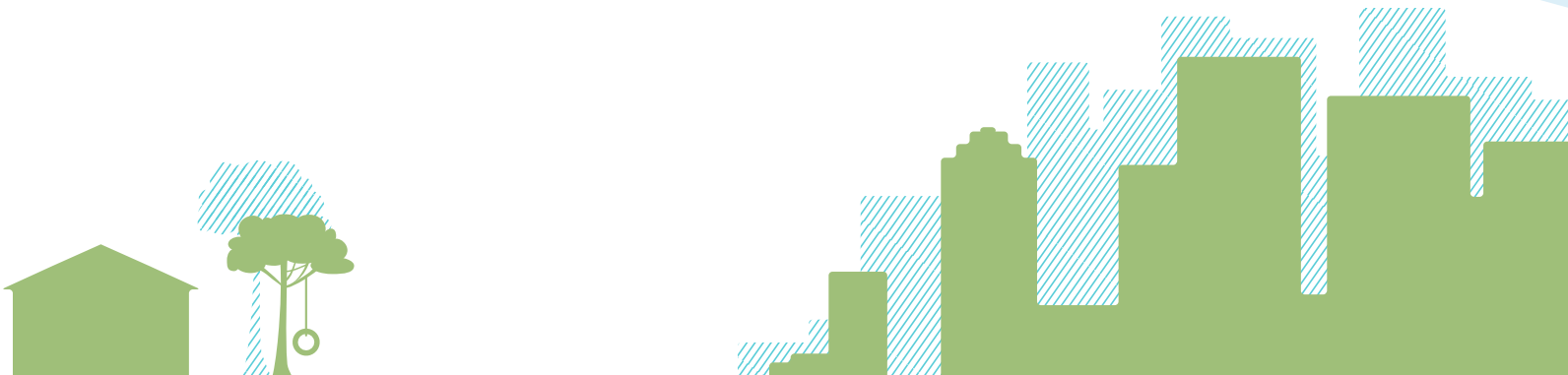
E•WASTE IN THE UNITED STATES

Take Home Worksheet, pg. 1

In the year 2000, over 2 million tons of electronic waste was generated in the US. These items included DVD's, cell phones, computers, and video game cartridges. If only a few castoff computers or gadgets had to be disposed of, it wouldn't be much of a problem. But by 2010, an estimated 250 million computers will become obsolete and 300 million TVs will be chucked out, creating a growing environmental and health problem.

COMPOSITION OF E•WASTE IN THE USA

Source: Municipal Solid Waste in the United States: 2000 Facts and Figures. US EPA Office of Solid Waste and Emergency Response. June 2002. pages 150-160.

These figures are shown in percentage and in weight.
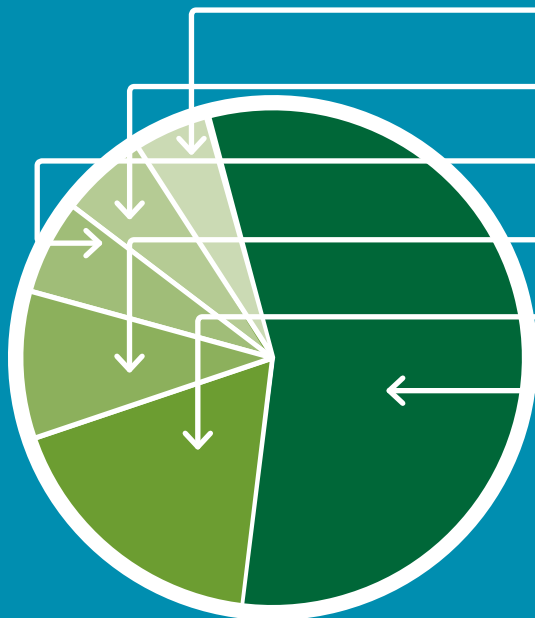
4.40% PC's > 93,474 tons

5.90% Monitors > 125,340 tons

6.10% Household Electronics > 129,588 tons

10.10% Commercial Electronics > 214,564 tons

17.90% Electronics Packaging > 380,268 tons

55.60% TV's > 1,181,166 tons

Total > 2,124,400 tons, for the year 2000

1 Looking at the graph "Composition of E-waste in the USA," what were the top two categories for electronic waste in the United States for 2000?

2 How do you think these percentages will change in the next 15 years as more electronics are sold?

3 The total electronic waste weight for the United States was 2,124,400 tons in the year 2000. How many pounds is that?

4 The population of the United States was 281,421,906 in 2000. How many pounds of electronic waste is that per person?

5 If the amount of e-waste is projected to grow 60% in the US from 2000 to 2010, how many tons and pounds would that be for 2010? (use weight figure in question #3 to calculate 2010 estimate)

6 What other options, besides landfilling, are there for the disposal of electronic items?

7 Name two hazardous substances that may be found inside a TV.

8 What effect on the environment could these substances have if not disposed of properly?

9 Name the electronic items on the pie chart that your family has disposed of in the last year. What are the options for your family's electronic waste disposal in your community?